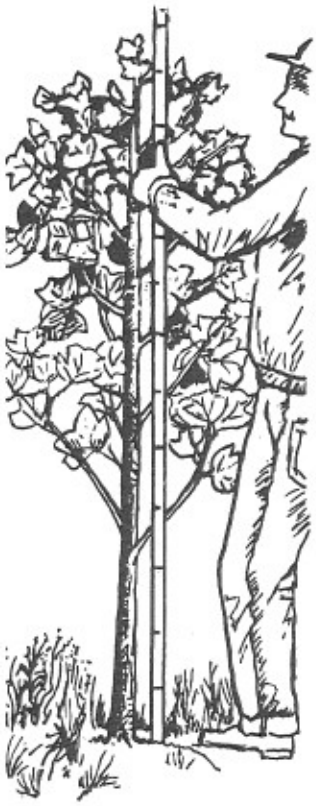

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LOBLOLLY PINE RELEASE STUDY

REPORT NUMBER

15

Virginia
Department of Forestry

LOBLOLLY PINE RELEASE
REPORT #15

By Thomas A. Dierauf

ABSTRACT

This study included two treatments: no release and aerial release using 2 pounds active ingredient of 2,4,5-T per acre during the fourth growing season. Hardwood competition was moderate. At age 19, released plots averaged 31 percent more basal area and 53 percent more volume in standard cords than check plots. Cordwood yields were related to both a free-to-grow index estimated at age 5 (r^2 = .854) and hardwood basal area at age 19 (r^2 = .756). Dominant and codominant height at age 19 was also related to hardwood basal area (r^2 = .532).

INTRODUCTION

This is the fifteenth in a series of Occasional Reports concerning release of loblolly pine seedlings from hardwood competition. This particular study was installed on the Lauter tract in Appomattox County, in the central Piedmont of Virginia. The previous stand was mixed hardwood, with oak predominating. The tract was drum-chopped and prescribed-burned in the summer of 1968 and planted in February of 1969. Part of the tract was released by aerial spraying in July of 1972, during the fourth season. Approximately two pounds active ingredient of 2,4,5-T was applied in a total volume of 5 gallons per acre.

GROWTH PLOT INSTALLATION

Permanent growth plots were installed in January and February of 1974, at age 5. Twelve 1/10-acre plots were installed, six each in the released and unreleased areas (Figure 1). Volunteer Virginia pine were cut down when the plots were installed. Hardwood competition was moderate, with scarlet oak the main competitor and chestnut oak second in importance.

Measurements were made at age 5, when the plots were installed, and again at ages 9, 13, 17, and 19. We had intended to make the final measurement at age 21, but the landowner decided to thin the stand at age 19. At age 5, each loblolly pine was measured for total height to the nearest foot and classified as to free-to-grow status using a four part classification system.1/ At later measurements, diameter at breast height of each loblolly pine was measured to the nearest inch, and a sample of trees in each diameter class was measured

1/ See Occasional Report No. 78 (Release Report No. 11) for a description and discussion of this classification system.

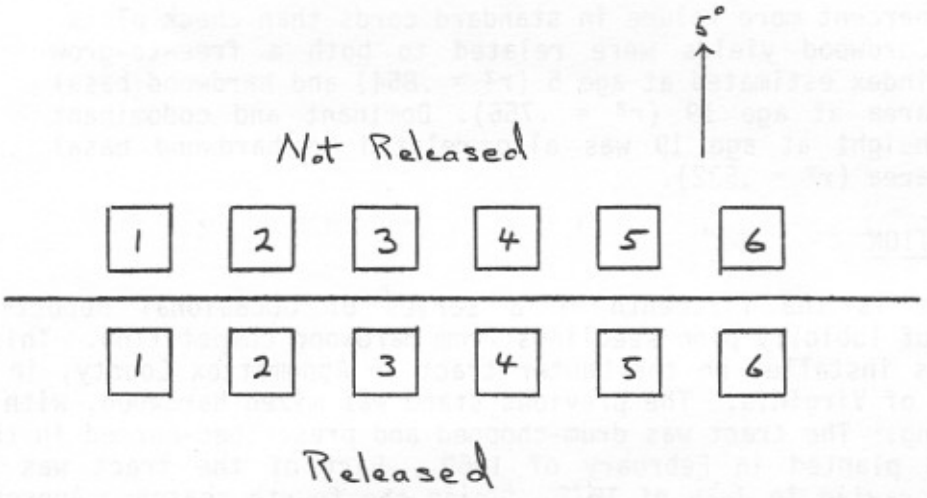

Figure 1. Layout of growth plots.

for total height to the nearest foot, noting which trees were dominant or codominant. For the final measurement at age 19, all hardwoods over .5 inch DBH were tallied by species, 1-inch diameter class, and crown class. Total heights to the nearest foot were measured on about two-thirds of the intermediate hardwoods (there were no codominant or dominant hardwoods).

RESULTS AND DISCUSSION

A summary of loblolly pine data for the five measurements is presented in Table 1. At age 19, released plots averaged 7.9 standard cords per acre more than check plots.2/ Differences due to release increased with time (Table 2). Table 3 presents stand tables for loblolly pine at age 19.

A summary of average hardwood data at the final measurement at age 19 is presented in Tables 4 and 5, and individual plot data is presented in Table 6. Released plots had about two-thirds as many hardwoods as check plots, and about half the hardwood basal area.

Cordwood yields of loblolly pine were related to the amount of hardwood present. Figure 2 shows pine cordwood yields related to hardwood basal area at age 19, for the 12 plots. A simple linear regression fitted to these data accounted for 76 percent of the variation in cordwood yields.3/

Cordwood yields also correlated well with the average free-to-grow index for each plot at age 5; in fact, the correlation was better than with hardwood basal area at age 19. Table 7 shows the percent of trees in each free-to-grow class for each plot, at age 5. In Figure 3, pine cordwood yields for each plot at age 19 are plotted over average free-to-grow index at age 5. A simple linear regression fitted to these data accounted for 85 percent of the variation in cordwood yields.4/

2/ Standard cords at age 19 were subjected to an analysis of variance for randomized blocks (caution should be used in interpreting the results of this analysis, because treatments could not be randomized). Yields on released plots were significantly greater than on check plots (probability of a larger F = .0036).

3/ Estimated standard cords = 29.02 - .6054 (hardwood basal area), r^2 = .756, probability of a larger F = .0002.

4/ Estimated standard cords = 38.58 - 11.3541 (free-to-grow index at age 5), r^2 = .854, probability of a larger F = .00002.

Table 1. A summary of loblolly data for check and aerial-released plots at ages 5, 9, 13, 17 and 19 years: number of trees per acre, average DBH, basal area per acre, standard cords per acre, and average height of dominant and codominant trees.*

	Check Plots						Released Plots					
Age	Plot	No.	DBH	BA	Cds	Ht.	Plot	No.	DBH	BA	Cds.	Ht.
5	1	680				9.2	1	670				8.0
	2	800				9.2	2	840				8.8
	3	700				9.0	3	860				8.0
	4	750				9.0	4	720				7.8
	5	820				7.9	5	670				7.7
	6	660				9.7	6	770				7.4
Means		735				9.0		775				8.0
9	1	680	3.13	40.4		23.6	1	670	3.76	54.8		23.0
	2	800	3.26	51.3		22.9	2	840	3.52	60.8		25.3
	3	660	3.12	39.1		23.6	3	860	3.48	60.5		22.5
	4	750	2.74	35.0		22.7	4	720	3.39	50.3		23.4
	5	810	2.61	35.9		22.6	5	670	3.37	45.7		22.9
	6	640	3.30	43.0		24.0	6	760	3.24	46.4		22.3
Means		723	3.03	40.8		23.2		753	3.46	53.1		23.2
13	1	660	4.21	68.1	4.4	32.1	1	670	4.91	92.8	8.7	33.2
	2	780	4.21	81.2	5.9	33.0	2	830	4.60	102.1	8.8	32.9
	3	640	4.17	67.2	4.9	31.1	3	840	4.58	102.3	8.4	33.0
	4	700	3.86	62.7	3.6	30.5	4	700	4.70	92.1	8.6	33.0
	5	760	3.78	68.2	4.0	31.2	5	650	4.71	85.3	8.5	34.2
	6	640	4.49	77.2	6.9	33.5	6	750	4.48	87.5	6.8	31.8
Means		697	4.12	70.8	5.0	31.9		740	4.66	93.7	8.3	33.0
17	1	650	4.69	84.8	10.0	39.3	1	660	5.55	117.2	16.3	38.7
	2	780	4.91	110.0	13.5	39.5	2	830	5.05	123.9	15.0	38.7
	3	630	4.81	88.7	9.9	36.6	3	820	5.35	136.0	17.6	38.5
	4	670	4.46	80.1	8.0	35.6	4	660	5.65	122.3	18.4	41.0
	5	720	4.56	91.4	9.6	35.9	5	630	5.60	113.6	17.4	41.6
	6	630	5.29	104.7	15.2	40.2	6	740	5.30	119.3	16.4	39.8
Means		680	4.79	93.3	11.0	37.8		723	5.42	122.0	16.8	39.7
19	1	630	5.21	100.5	14.7	42.6	1	660	5.91	132.9	23.5	44.2
	2	760	5.12	116.2	16.7	43.1	2	830	5.29	137.2	21.7	44.8
	3	620	5.16	99.9	13.9	40.8	3	820	5.55	147.1	23.3	43.8
	4	670	4.75	90.8	11.1	39.8	4	660	5.92	135.2	23.8	45.1
	5	670	5.06	101.5	13.2	40.4	5	630	5.86	126.8	22.8	46.0
	6	630	5.52	115.0	19.2	42.8	6	740	5.64	135.4	21.3	42.9
Means		663	5.14	104.0	14.8	41.6		723	5.70	135.8	22.7	44.5

* Except at age 5, where heights presented are for all trees.

Table 2. Average differences between check and released plots at each measurement, for basal area and standard cords per acre.

	Released minus Check	
Age	Basal Area	Std. Cds.
9	12.3	-
13	22.9	3.3
17	28.7	5.8
19	31.8	7.9

Table 3. Average number of loblolly pines per acre by diameter class at age 19.

DBH	Check Plots	Released Plots
1	7	7
2	37	13
3	60	35
4	110	95
5	158	153
6	153	207
7	116	140
8	20	63
9	2	10
TOTALS	663	723

Table 4. Average numbers of hardwoods per acre by species and diameter class at age 19.

	Check Plots DBH					
Species	1	2	3	4	5	Totals
Chestnut oak	261	52	12	5	2	332
White oak	117	72	26			215
Red oak	330	206	83	8	2	629
Red Maple	75	23				98
Dogwood	118	17				135
Hickory	50	5				55
Blackgum	147					147
Yellow-poplar	7		2			9
Black cherry	3		2			5
Persimmon	7					7
Sourwood	5	7				12
Totals	1,120	382	125	13	4	1,644

	Released Plots DBH					
Species	1	2	3	4	5	Totals
Chestnut oak	101	10				111
White oak	115	42				157
Red oak	280	120	5	7	2	414
Red Maple	23	3	18			44
Dogwood	96	15				111
Hickory	67	3				70
Blackgum	67					67
Yellow-poplar	17	17	5			39
Black cherry	17	2	8			27
Persimmon	18					18
Sourwood	7	3				10
Totals	808	215	36	7	2	1,068

Table 5. Average numbers of hardwoods per acre by diameter class and crown class, and basal area by crown class, at age 19.

Check Plots

DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	1,120				1,120
2	382				382
3	67	58			125
4		13			13
5		3			3
Totals	1,569	74			1,643
B.A.	17.7	4.4			22.1

Released Plots

DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	808				808
2	215				215
3	23	13			36
4		7			7
5		2			2
Totals	1,046	22			1,068
B.A.	10.2	1.5			11.7

Table 6. Numbers of hardwoods by diameter class and crown class, and basal area by crown class, on each 1/10-acre plot.

Plot - Check #1

DBH	O	I	CD	D	Totals
1	79				79
2	32				32
3	8	7			15
4		1			1
Totals	119	8			127
BA	1.52	.43			1.95

Plot - Check #2

DBH	O	I	CD	D	Totals
1	110				110
2	39				39
3	11	2			13
4		1			1
Totals	160	3			163
BA	1.99	.18			2.18

Plot - Check #3

DBH	O	I	CD	D	Totals
1	109				109
2	36				36
3	2	7			9
4		1			1
5		1			1
Totals	147	9			156
BA	1.48	.57			2.04

Plot - Check #4

DBH	O	I	CD	D	Totals
1	124				124
2	49				49
3	9	8			17
4		5			5
5		1			1
Totals	182	14			196
BA	2.19	.96			3.15

Plot - Check #5

DBH	O	I	CD	D	Totals
1	108				108
2	38				38
3	5	8			13
Totals	151	8			159
BA	1.66	.39			2.06

Plot - Check #6

DBH	O	I	CD	D	Totals
1	142				142
2	35				35
3	5	3			8
Totals	182	3			185
BA	1.78	.15			1.93

Plot - Release #1

DBH	O	I	CD	D	Totals
1	84				84
2	14				14
3					
4					
Totals	98				98
BA	.76				.76

Plot - Release #2

DBH	O	I	CD	D	Totals
1	68				68
2	24				24
3	1				1
4		1			1
Totals	93	1			94
BA	.94	.09			1.03

Plot - Release #3

DBH	O	I	CD	D	Totals
1	70				70
2	22				22
3	2	1			3
4					
Totals	94	1			95
BA	.96	.05			1.01

Plot - Release #4

DBH	O	I	CD	D	Totals
1	82				82
2	27				27
3	5	3			8
4		1			1
Totals	114	4			118
BA	1.28	.24			1.52

Plot - Release #5

DBH	O	I	CD	D	Totals
1	85				85
2	26				26
3	5				5
4		1			1
5		1			1
Totals	116	2			118
BA	1.28	.22			1.50

Plot - Release #6

DBH	O	I	CD	D	Totals
1	96				96
2	16				16
3	1	4			5
4		1			1
5					
Totals	113	5			118
BA	.92	.28			1.20

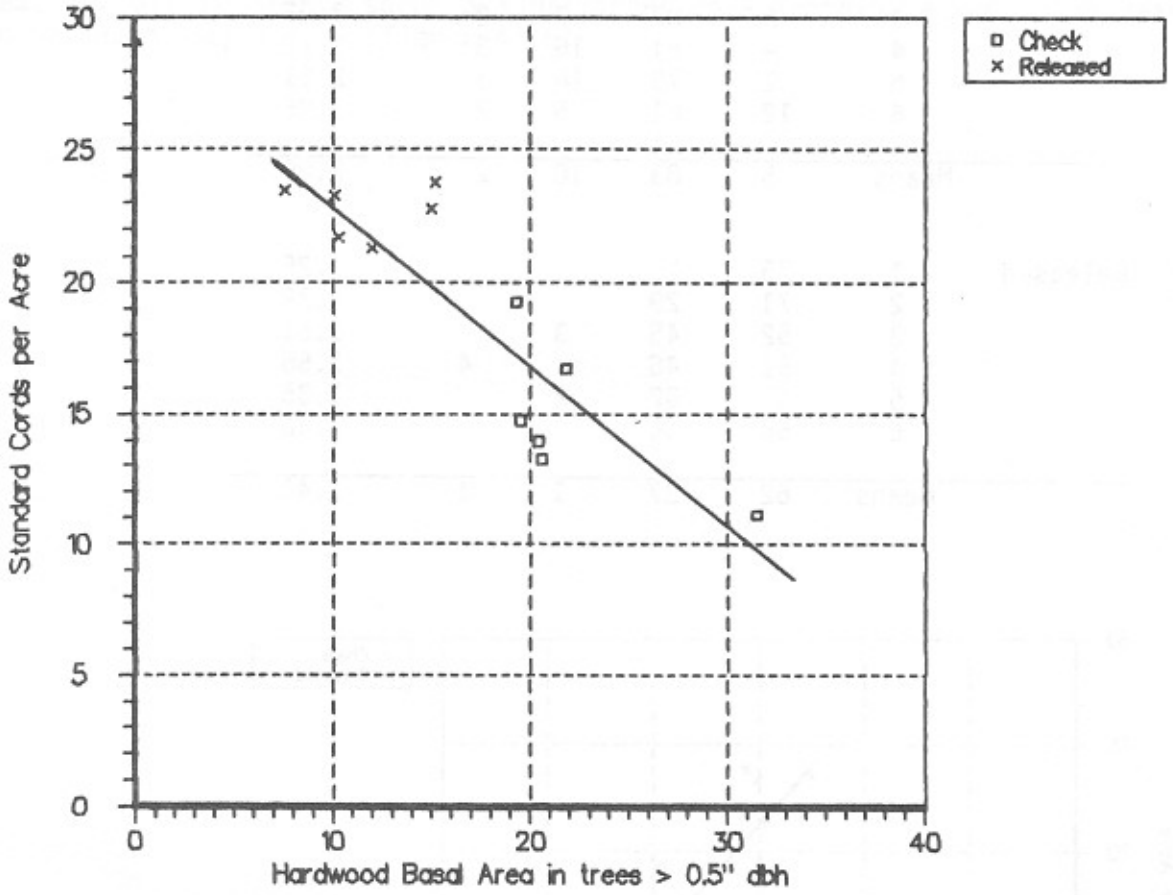

Figure 2. Pine cordwood yields at age 19 related to hardwood basal area.

Table 7. Percent of trees by free-to-grow class for each plot, at age 5.

	Plot	1	2	3	4	Means
Check	1	4	80	16		2.13
	2	9	88	1	1	1.95
	3	5	87	7	2	2.05
	4	-	81	16	3	2.22
	5	2	79	16	3	2.21
	6	12	81	5	2	1.96
	Means	5	83	10	2	2.09
Released	1	75	25			1.25
	2	71	29			1.29
	3	52	45	3		1.51
	4	51	45		4	1.56
	5	67	32	2		1.35
	6	54	46			1.46
	Means	62	37	1	1	1.40

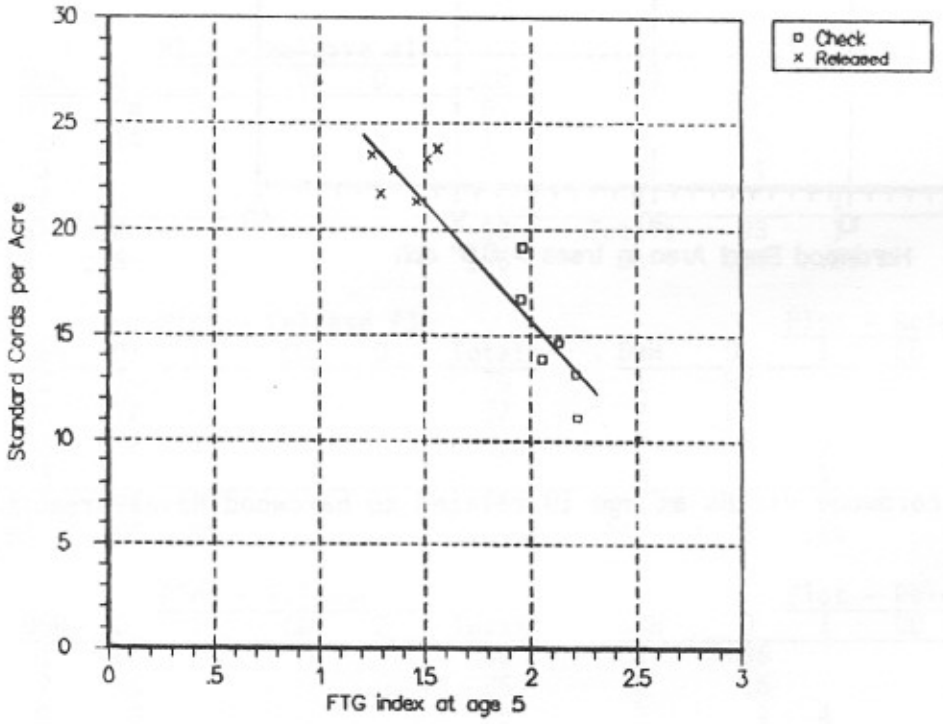

Figure 3. Pine cordwood yields at age 19 related to FTG index.

Dominant and codominant pines have grown faster on the released plots than on the check plots. Compared to the check plots, average height on the released plots was 1.0 foot shorter at age 5, equal at age 9, and 1.1, 1.9, and 2.9 feet taller at ages 13, 17 and 19 respectively (Table 1). There is nothing to suggest that site index should be higher on the released plots. Hardwood competition seems to have affected height of dominant and codominant pines, as we have noted in other release studies.5/ A plotting of average dominant and codominant height of loblolly pine at age 19 over hardwood basal area, for all 12 plots, shows a significant relationship between pine height and hardwood competition (Figure 4).6/

5/ See Occasional Report No. 75 (Release Report No. 8) for a discussion of this relationship and its probable cause.

6/ Estimated pine height = 46.62 - .2121 (hardwood basal area), r^2 = .532, probability of a larger F = .007.

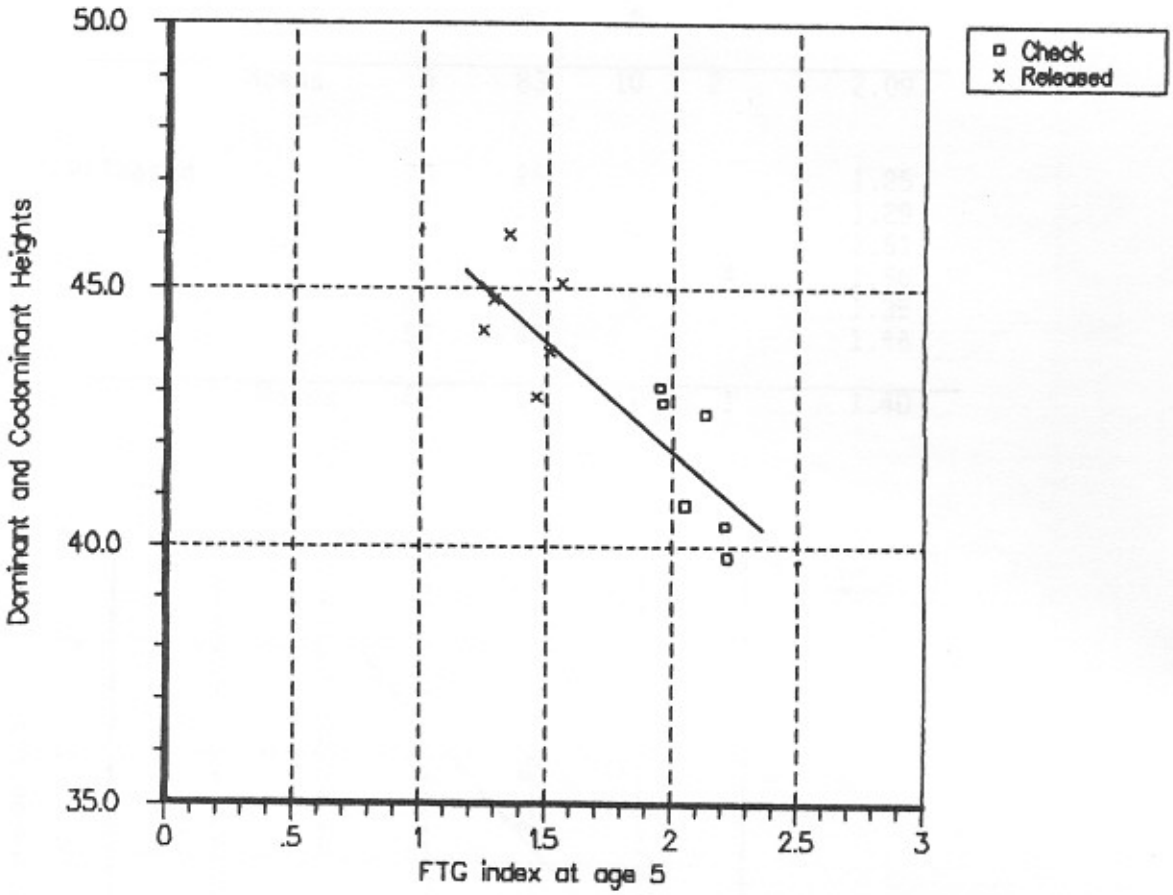

Figure 4. Pine dominant and codominant height at age 19 related to FTG index.